UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
HORTICULTURAL CROPS RESEARCH BRANCH and
ENTOMOLOGY RESEARCH BRANCH

CONTROL OF DISEASES AND INSECTS IN HOME ORCHARDS AND VINEYARDS

Fruit trees and grape vines in city yards and suburban gardens are subject to all the diseases and insect pests that occur in commercial orchards and vineyards. The value of the crop in home plantings does not justify the purchase of expensive control equipment but some control measures must be practiced or the entire crop is apt to drop prematurely or be so wormy and distorted that it is worthless.

The following brief discussion of control procedures is intended to apply particularly to the humid part of the United States, that is, to the part east of the Rocky Mountains. Home-owners in the Intermountain and Pacific Coast States who need help in their fruit disease and insect problems should seek aid of their county agricultural agent or their State experiment station, agricultural college or extension specialists. In fact, home gardeners throughout the country should form the habit of consulting their State specialists. Local conditions largely determine the exact time when a control measure can be applied most effectively and the local or State specialists can best supply such information.

The various fungi and insects attacking fruit trees and grape vines have specific life cycles. They appear at certain times each season and their control involves three factors: (1) spraying with the proper fungicides or insecticides, (2) thoroughness of applications, and (3) timeliness of applications. A fault in any one of those factors will largely, if not entirely, defeat the object of the control measures employed.

FUNGICIDES AND INSECTICIDES

A variety of effective materials such as liquid lime sulfur, wettable sulfur, ferbam, zineb, dichlone and captan is available for the control of fungus diseases. Commonly used insecticides are: lead arsenate, DDT, methoxychlor, malathion, nicotine sulfate and paradichlorobenzene. In most cases these materials may be purchased in small packages from seedsmen, nurserymen and florists and hardware and other dealers. By following the directions on the labels, very satisfactory spray mixtures can be prepared for home use. In recent years general purpose (one package) fruit sprays have been introduced as a solution to the home growers' spray problem. Before purchasing any specific brand of these one-package sprays, the home grower should examine the label to be sure that it is recommended for use on fruit crops and contains one or more of both the fungicides and insecticides listed below:

Fungicides (for disease control)	Insecticides (for insect control)
Captan	DDT
Ferbam	Lead arsenate
Wettable sulfur	Methoxychlor
Zineb	Malathion

Mixtures containing copper compounds should not be used on peach, sweet cherry, and certain types of plum trees.

THOROUGHNESS OF APPLICATION

The sprays should be applied with care and in sufficient quantity to cover thoroughly all the leaves and fruit. The pint or quart size hand atomizers commonly used for household sprays are inadequate for spraying fruit trees and grape vines. A bucket pump or a 3-gallon compressed air sprayer represents the minimum equipment that can be used. A wheelbarrow sprayer with a good pump is even more satisfactory for with this type of machine it is possible to obtain a pressure of 100 pounds or more and reach the tops of most trees in the home orchard.

In some sections commercial firms or individuals offer spraying service to home owners. For scattered individual trees the cost of such service is apt to be rather high. However, if the operator is experienced and understands the problems of disease and insect control and uses the proper materials, the degree of control achieved is apt to be better than that obtained by using a 3-gallon compressed air sprayer.

TIMELINESS OF APPLICATION

Disease-producing fungi and insects make their appearance and attack the trees and vines at certain times during the growing season. Sprays for their control must therefore be timed properly for the major aim of all control programs is to prevent the attacks of the various pests. With but few exceptions most of these diseases and insects can be controlled only by a series of sprays applied at specified times throughout the season. The number of applications given in this leaflet falls short of the treatment usually given commercial orchards and vineyards. Certain insecticides used by commercial growers are not included here because of the extreme hazards involved in their use around the house, or because for other reasons they do not lend themselves to small-scale operations; however, with reasonable attention to the timing of the sprays listed here, and by making a definite effort to keep the leaves and fruit covered, it is possible to produce a reasonably blemish-free crop of fruit in most seasons.

The quantities given are tablespoonfuls (T) required for the preparation of 1 gallon of spray and should be multiplied by the number of gallons of spray to be prepared.

DISEASES AND INSECT PESTS OF APPLES, PEARS AND QUINCES

Most diseases and insect pests of the apple, pear and quince, such as scab, fruit rots, the various leaf spots, the San Jose scale, the codling moth or apple worm and caterpillars can be largely controlled by spraying. Dusting is less effective than spraying and is not recommended for the home grower. The following schedule for control of the more serious diseases and insect pests is suggested for the home orchardist who cannot follow the detailed program recommended to the commercial grower:

(1) Apply before growth begins in the spring. Lime-sulfur, 1 pint to 1 gallon of water or 3 percent oil emulsion.

(2) Apply just before blossoms open. Lime-sulfur 1/5 pint or sulfur 4T and ferbam 2T or the quantity of the one-package general purpose spray as recommended by manufacturer.

(3) Apply just after petals have fallen. Sulfur 4T and ferbam 2T or captan 2T or zineb 2T, plus lead arsenate 2T; or the amount of a general purpose spray as recommended by manufacturer.

(4) Apply 3 weeks after petals have fallen. Sulfur 4T and ferbam 2T or captan 2T or zineb 2T with DDT 1-1/2T; or general purpose spray as recommended by manufacturer.

(5) Apply 3 weeks later. Captan 2T with DDT 1-1/2T; or general purpose spray.

(6) Apply about July 1 on varieties ripening after August 15. Captan 2T plus DDT 1-1/2T; or general purpose spray as recommended by manufacturer.

Since some of these sprays are poisonous, fruits should not be sprayed with them within the last four weeks before harvest. If spray residue is evident at harvest the fruit should be thoroughly washed before being eaten or offered for sale. The same sprays may be used at the same time on sour cherries, but not on peaches, plums or sweet cherries. The sprays recommended for peaches and plums may also be used safely on apples, pears, and cherries; they will not control apple and pear pests as well but if one set of sprays is desired for all these fruits, those recommended for peaches and plums should be used. All rotten, wormy and scabby fruit should be removed from the tree or from the ground and destroyed.

DISEASES AND INSECT PESTS OF PEACHES, PLUMS AND CHERRIES

Certain diseases and insect pests of the peach, plum and cherry such as scab, rot, leaf curl, the San Jose scale and the plum curculio or worm, can be controlled by spraying or dusting as follows:

(1) In the fall after all the leaves have fallen or late in the winter before the buds begin to swell spray with lime-sulfur, 1 pint to 1 gallon of water.

(2) Apply about 10 days after petals have fallen. Wettable sulfur 5T plus either lead arsenate 2T with hydrated lime 2T or methoxychlor 3T. If general purpose spray contains both fungicide and insecticide, it may be substituted for the materials recommended above.

(3) Apply two weeks later. Use same materials as recommended for second application.

(4) If the oriental fruit moth is a problem, spray (a) with 50 percent DDT wettable powder using 1-1/2T in 1 gallon of water five weeks before the fruit is expected to ripen and (b) with 1T in 1 gallon of water two weeks later.

(5) Apply 2 to 4 weeks before fruit is expected to ripen. Sulfur 5T. No insecticide should be used in this application. The sulfur spray application can be combined with the second one for oriental fruit moth, if desired. Home owners who are not equipped to spray can use a dust mixture consisting of 8 parts sulfur, 1 part hydrated lime and 1 part lead arsenate beginning at the time recommended for the third spray and continuing through the remainder of the program.

These sprays or dusts contain poisons and if spray residues are in evidence when the fruit is ripe they should be removed before the fruit is eaten or offered for sale.

DISEASES AND INSECT PESTS OF AMERICAN BUNCH GRAPES

Most important diseases and insect pests of American bunch grapes, such as black rot, anthracnose, mildew, grape berry moth, leafhoppers and Japanese beetle can be largely controlled by spraying. The following schedule for control of the more serious diseases and insect pests is suggested for home gardeners:

(1) Apply when new shoot growth is 7 to 10 inches long. Ferbam 2T.
(2) Apply 3 to 5 days before blossoms open. Ferbam 2T plus DDT 1-1/2T. If mildew is a problem use bordeaux mixture (3 teaspoonfuls powdered copper sulphate plus 2T hydrated lime in one gallon of water) or use dried bordeaux mixture at the rate recommended by the manufacturer.
(3) Apply immediately after the flower petals drop. Use same materials as recommended for the second application.
(4) Apply 10 days after the petals drop. Ferbam 2T plus DDT 1-1/2T.
(5) Apply 5 to 6 weeks after the petals drop. DDT 1-1/2T. If mildew is a problem include bordeaux mixture (1-1/2 teaspoonfuls powdered copper sulphate plus 2T hydrated lime in one gallon of water) or dried bordeaux mixture at the rate recommended by the manufacturer.
(6) Apply 10 days later. Use same materials recommended for the fifth application.

PEACH TREE BORER

The presence of a mass of gum and sawdust-like material at the base of the tree usually indicates the presence of the peach borer at or near the ground line. Peach trees are seriously weakened by the attack of this insect and in extreme cases may be killed outright. The borers may be controlled by carefully digging them out with a sharp knife, by applying a ring of paradichlorobenzene 1 to 2 inches from the tree at the rate of 3/4 to 1 ounce per tree and then covering it with several inches of closely packed soil or by spraying the trunk of the trees with DDT, 6 T per gallon of water. Two applications are necessary in the latitude of Virginia and northward, one about July 1 to 15 and another about a month later, or immediately after harvest. Farther south, three applications, the first July 10 to 15 and the second and third at 3- or 4-week intervals, are recommended. The paradichlorobenzene treatment is most effective if applied during September or October, the date varying with the locality.

In the South, peach trees less than 4 years of age are sometimes injured by the use of paradichlorobenzene. In the North such injury rarely occurs.

PLANT LICE OR APHIDS

Plant lice, or aphids, sometimes become abundant, and require the application of control measures. Infestations by these insects, however, are so irregular in their development, that no provision for their control is made in the regular spray programs. When necessary, aphids may be controlled by spraying the trees with nicotine sulfate, 1 teaspoonful per gallon of spray containing lime-sulfur or enough soap to make the water feel soapy to the touch - usually an ounce or less per gallon or with malathion wettable powder 2T per gallon of spray.

SPRAY AND OTHER CONTROL MATERIALS

CAUTION - Some of the materials listed here are dangerous poisons and should be handled and stored with great care. They should be kept in plainly labeled containers away from food products and where children or pets cannot have ready access to them. Care should be taken not to inhale any of the dust or spray when the material is being mixed or applied. Children and pets should be kept out of a treated area until the spray has dried.

Bordeaux mixture. A copper fungicide. It is prepared by combining equal weights of hydrated lime and powdered copper sulphate in water. Each chemical should be dissolved in a small amount of water before it is mixed with the other. The mixture should then be brought to required volume by adding more water. Copper sulphate will corrode metals so the mixture should be made in a wooden, glass or earthenware container and poured into the sprayer through a cloth strainer just prior to use. The mixture must be made fresh each time it is used. Dried ready-mixed forms of bordeaux mixture can be purchased in packages. The dried form is usually more convenient for the home gardener to use.

Captan. An organic fungicide sold under the trade names of Captan 50-W or Orthocide 50 Wettable.

DDT - DDT is used for controlling both leaf eating and other chewing insects and some sucking insects. It is available in a wide variety of formulations, of which the one preferred for use in sprays to be applied to fruit trees is a water wettable powder, usually containing 50 percent technical DDT. For general use, 1-1/2 level tablespoonfuls of a 50 percent wettable powder per gallon of water or 2 pounds in 100 gallons is most satisfactory.

Ferbam - An iron carbamate fungicide. Lime should not be used with spray mixture containing ferbam.

Lead arsenate - Lead arsenate is used for controlling leaf-eating and other chewing insects. It is purchased as a pink powder and is used at the rate of 3 pounds in 100 gallons of water or about 2 level tablespoonfuls per gallon. It is commonly sold under its own name or ready-mixed with one of the other sprays with which it is commonly used. On peaches, lead arsenate should be

used with an equal quantity of fresh hydrated lime or mason's lime. Lead Arsenate should not be used except when the fruit is very small or where washing, brushing or peeling the fruit will remove all spray residues.

Lime-sulfur - Lime-sulfur is a clear fluid, amber to cherry red in color. It is used in winter at the rate of 1 pint to 1 gallon of water and during the growing season at the rate of 1 pint to 5 gallons of water. It is sometimes sold in the dry state. One-half pound of the dry material equals 1 pint of fluid.

Malathion - An organic phosphate insecticide that can be used safely with ordinary precautions. It is recommended primarily for controlling plant lice, or aphids and mites but it is also quite effective in controlling a number of other important fruit pests such as the codling moth, plum curculio, peach tree borers, pear psylla and grape berry moth. It is widely used in commercial all-purpose spray formulations and is most commonly available separately as a 25 percent wettable powder or a 50 percent emulsifiable concentrate. For general use, the wettable powder formulation is preferred and 2 level tablespoonfuls per gallon of water or 2 pounds in 100 gallons is most satisfactory.

Methoxychlor - Methoxyclor is similar to DDT and is used for many of the same purposes. However it is more effective against the plum curculio than is DDT. For fruit spraying a wettable powder is preferable. A 50 percent mixture should be used at a strength of 3 tablespoonfuls per gallon.

Nicotine - Nicotine is very useful in the control of aphids and certain soft-bodied insects which it kills by direct contact. This insecticide is available chiefly as a concentrated solution containing 40 percent of actual nicotine in the form of nicotine sulfate. This solution should be used at a strength of about 1 teaspoonful per gallon of spray or 1 fluid ounce in 8 gallons and should always be used with lime-sulfur or with enough soap dissolved in the spray mixture to make the water soapy to the touch - usually an ounce or less per gallon.

CAUTION - Nicotine and its compounds are violent poisons and all precautions outlined earlier should be followed. Avoid exposure to nicotine fumes or to spray drift resulting from its application. If the concentrated solution is spilled on the skin it should be washed off immediately with water.

Oils and emulsions - Oil emulsions and miscible oils are sold under various trade names and can be identified by the labels. The oils and emulsions are useful in the control of scale insects but should be applied only when the trees are wholly dormant.

Paradichlorobenzene - Paradichlorobenzene is a white crystalline substance somewhat similar to naphthalene. It is used for peach tree borer control. The pure chemical, of the fineness of granulated sugar or in small flake crystals, should be obtained. Paradichlorobenzene is used for peach borer control at the rate of 3/4 to 1 ounce per tree.

Wettable sulfur - Wettable sulfur is sold under various trade names and can usually be identified by the word "sulfur" in the analysis given on the label, but it should not be confused with lime-sulfur which is either a clear amber or reddish fluid or a powder that forms such a fluid when mixed with water. Wettable sulfur mixed with water forms a white to cream-colored or pale yellowish fluid.

Zineb - An organic fungicide containing zinc carbamate.